Management of an important fungal aerial disease of bananas (Black Leaf Streak Disease) without chemical control

Claire Guillermet[1], Eric Fouré[2], Marc Dorel[3], Thierry Lescot[2], Luc de Lapeyre de Bellaire*[2]

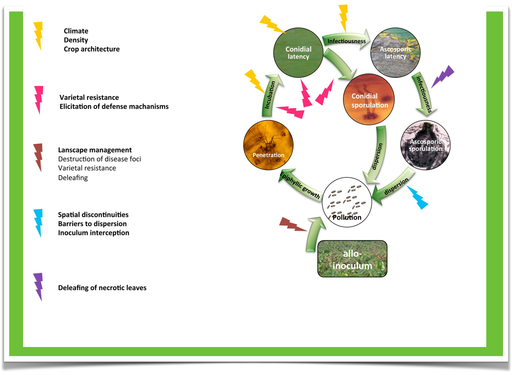
* Corresponding author: luc.de_lapeyre_de_bellaire@cirad.fr

1 CIRAD-Persyst, UPR Systèmes bananes et ananas, Quartier Petit Morne - BP 214 - 97285 Le Lamentin Cedex 2, Martinique (FWI), France,
2 CIRAD-Persyst, UPR Systèmes bananes et ananas, TA B-26 / PS4, Bd de la Lironde, 34398 Montpellier Cedex 5, France,
3 CIRAD-Persyst, UPR Systèmes bananes et ananas, Neufchâteau - Ste Marie - 97130 Capesterre Belle Eau – Guadeloupe (FWI), France

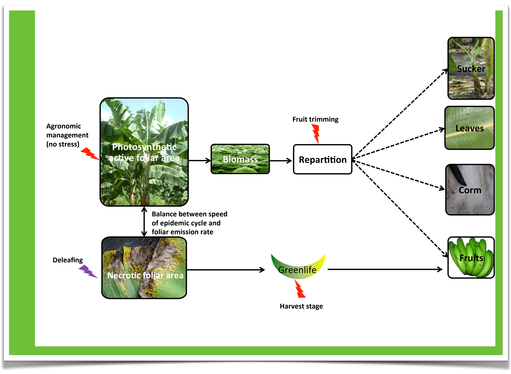
An integrated approach for the most important biotic constraint of export dessert bananas

Black Leaf Streak Disease (BLSD), caused by the fungus *Mycosphaerella fijiensis*, is a foliar disease resulting in substantial yield losses. Most importantly, this disease alters fruit conservation (fruit greenlife) that renders bananas unfit for export because greenlife should exceed transit time. The banana industry relies on the cultivation of a unique susceptible cultivar, generally in humid tropical conditions conducive for BLSD. As a consequence, this industry requires an intensive use of fungicides. However severe constraints to chemical control have emerged : fungicide resistance, increasing costs, environmental pollution and evolution of legislation that becomes very restrictive in some countries. Then, alternatives to chemical control is an important challenge for this industry and more generally for the control of a fungal aerial pathogen. The design of cropping systems excluding the use of fungicides requires an innovative agro-ecological approach mixing cultural practices aiming to slow down the epidemic cycle and cultural practices aiming to reinforce crop tolerance.

Slow down epidemic cycle through specific cultural practices



Reduce crop damages reinforcing crop tolerance



Exemple of agro-ecological control of BLSD in a commercial plantation of Dominican Republic (dry tropical conditions)

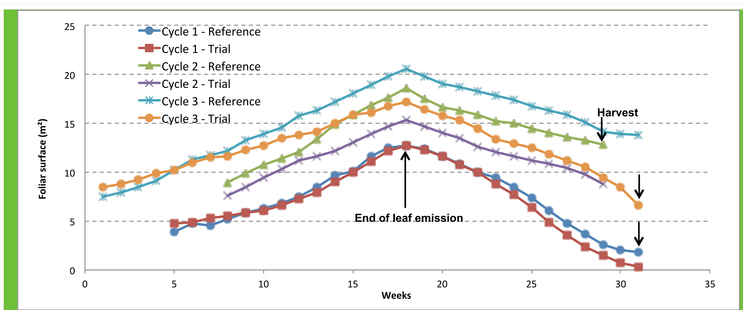
Cultural practices of this cropping system evaluated over 3 crop cycles

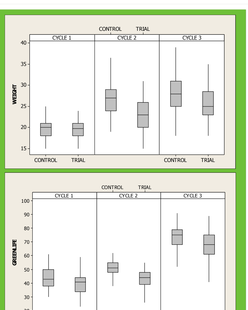
1. Slow down epidemic cycle

- Dry climate
- Deleafing of necrotic leaves before flowering
- Low allo-inoculum (at landscape scale bananas are alternated with other crops)

2. Reinforce crop tolerance

- Optimal agronomic management (high level of nutrition, optimal irrigation, monitoring of telluric parasitism)
- Deleafing of necrotic leaf portions after flowering





Results

- Foliar area decreased after flowering in different manners according to crop cycles and disease pressure.
- Low weight losses ranging from 0% (1st cycle) to 15% (2nd cycle).
- Greenlife always remained high (40-50 days at 13°C), even on the trial when few leaves were present at harvest time (1st cycle).

Conclusion

- Deleafing enable to maintain a high greenlife compatible with exportation.
- In dry tropical conditions yield losses are low as long as foliar leaf emission is important.

Perpectives

- Further evaluation of this cropping system in tropical humid conditions.
- Introduce new practices for better control such as crop mixtures or the use of elicitors of defense mechanisms.
- Provide a better understanding of photosynthetic compensation and assimilates remobilization from different plant organs in order to optimize yield according to source-sink ratio.
- Provide a better understanding of disease dynamics at field level in an environment where ascospores are not present in auto-inoculum.
- Modelling of disease and crop interactions with cultural practices in order to optimize control through simulation.

International Symposium on Agroecology for Food Security and Nutrition from 18 to 19 September 2014 at FAO Headquarters in Rome.